

**TC11 INSTALLATION DIAGNOSTICS (IUT11)**

**USER'S GUIDE**



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## TABLE OF CONTENTS

Section	Page
<b>ONE GENERAL DESCRIPTION</b>	
1.1 INTRODUCTION .....	1-1
1.2 PRODUCT OVERVIEW .....	1-1
1.3 DISTRIBUTION MEDIA .....	1-1
1.4 COMPATIBILITY .....	1-2
1.4.1 HARDWARE .....	1-2
1.4.2 SOFTWARE .....	1-2
1.5 RELATED DOCUMENTATION .....	1-2
<b>TWO OPERATION</b>	
2.1 OVERVIEW .....	2-1
2.2 LOAD AND START PROCEDURES .....	2-1
2.2.1 LOAD PROCEDURE .....	2-1
2.2.2 SAMPLE CONFIGURE STATEMENT FOR VAX-11/730 .....	2-1
2.2.3 SAMPLE CONFIGURE STATEMENT FOR VAX-11/750 .....	2-2
2.2.4 SAMPLE CONFIGURE STATEMENT FOR VAX-11/780 .....	2-2
2.2.5 START PROCEDURE .....	2-2
2.3 TESTS .....	2-3
2.3.1 FUNCTIONALITY: TESTS 1 THROUGH 12 .....	2-3
2.3.2 CONFIGURATION SECTION .....	2-5
2.3.3 PE SECTION .....	2-6
2.3.4 TAPE SECTION .....	2-6
2.4 SAMPLE DIALOG .....	2-8

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## 1.1 INTRODUCTION

This manual is designed to serve as a guide for those using the Emulex TC11 Installation Diagnostic, IUT11, on Digital Equipment Corporation (DEC) VAX-11 computers. IUT11 is designed to run under the Emulex VAX Monitor, EVM.

This program is designed for use by qualified installers of Emulex equipment, and thus it assumes that the user has some knowledge of hardware configurations, VAX architecture and terminology, and interpretation of error messages and device register contents.

This document contains two main sections, the contents of which are described briefly below.

Section 1            General Description: This section contains an overview of IUT11, including its functions, distribution media, hardware and software compatibility, and related documentation.

Section 2            Operation: Describes operation of IUT11, including load and start procedures, diagnostic tests, and sample dialog.

## 1.2 PRODUCT OVERVIEW

IUT11 is an installation and maintenance diagnostic for the TC11 tape controller. The TC11 emulates the DEC TM11 tape subsystem, allowing the configuration of up to four tape transports per TC11.

## 1.3 DISTRIBUTION MEDIA

The following table lists and describes distribution media for IUT11 and other Emulex VAX diagnostic software.

Emulex P/N	Description	
-		-
VX9960407-00	TU58 cassette for VAX-11/750	
VX9960507-00	Eight-inch floppy diskette for VAX-11/780	
VX9960910-00	9-track mag tape for VAX-8600	

## Related Documentation

### 1.4 COMPATIBILITY

#### 1.4.1 HARDWARE

IUT11 requires the following hardware:

- o DEC VAX-11/730, 11/750, or 11/780 CPU
- o 256K words memory
- o UNIBUS adapter
- o Console device
- o Emulex TC11 or TC11/PE tape controller
- o TC11 supported magnetic tape drive

#### 1.4.2 SOFTWARE

IUT11 is designed to run with the Emulex VAX Monitor, EVM. For information on EVM, see the EVM user's guide referenced in subsection 1.5.

### 1.5 RELATED DOCUMENTATION

Title: Emulex VAX Monitor (EVM) User's Guide  
Publication Number: VX9950901-00  
Publisher: Emulex Corporation  
3545 Harbor Blvd.  
Costa Mesa, CA 92626  
(714) 662-5600 TWX 910-595-2521

Title: VAX Configuration Utility (IVV000) User's Guide  
Publication Number: VX9950905-00  
Publisher: Emulex Corporation  
3545 Harbor Blvd.  
Costa Mesa, CA 92626  
(714) 662-5600 TWX 910-595-2521

Title: TC11 (TM11/TU10 Compatible) Tape Controller  
Technical Manual  
Publication Number: TC1151002-00  
Publisher: Emulex Corporation  
3545 Harbor Blvd.  
Costa Mesa, CA 92626  
(714) 662-5600 TWX 910-595-2521

## 2.1 OVERVIEW

This section describes IUT11 load and start procedures, defines the available diagnostic tests, and presents sample configure statements and sample output.

User input appears in bold type, to distinguish it from program output. The symbol <return> indicates the carriage return key. Addresses are given in octal radix.

## 2.2 LOAD AND START PROCEDURES

The procedure used to invoke EVM varies from one VAX system to another. For a description of EVM bootstrapping procedures, see the Emulex VAX Monitor (EVM) User's Guide (reference given in subsection 1.5).

### 2.2.1 LOAD PROCEDURE

After the EVM> prompt has appeared on the screen, type the following. (The default filename extension is .EXE.)

**EVM>LOAD IUT11<return>**

The LOAD statement is followed by a SET CONFIGURATION statement, the content of which depends upon the VAX system being used. The IUT11 device link table contains defined default hardware configurations for the VAX-11/730, 11/750, and 11/780, but you may need to use the SET CONFIGURATION statement to set up an alternate hardware configuration. Sample configure statements are presented in the following subsections.

### 2.2.2 SAMPLE CONFIGURE STATEMENT FOR VAX-11/730

The following statement refers to a VAX-11/730 with a TC11 at the standard address and vector (772520 and 224 respectively):

**EVM>SET CONFIG/CSR:772520/VECTOR:224<return>**

### 2.2.3 SAMPLE CONFIGURE STATEMENT FOR VAX-11/750

The following statement refers to a VAX-11/750 with a TC11 at the standard address and vector (772520 and 224) and UNIBUS adapter UBA0: (base address FC0000). See the EVM user's guide for information regarding the abbreviation of commands.

```
EVM>SET C/CSR:772520/VECTOR:224/ADAPTER:0/BR:5/UBR:5<return>
```

/ADAPTER needs to be specified only if a value other than UBA0: is desired. Acceptable values for ADAPTER are 0 or 1, with 0 the default:

```
ADAPTER 0      UBA0, FC0000
ADAPTER 1      UBA1, F30000
```

/BR and /UBR are optional in this sample statement, because the default value for both these parameters is 5. It is necessary to include the /BR and /UBR qualifiers only if their values are different from the default.

### 2.2.4 SAMPLE CONFIGURE STATEMENT FOR VAX-11/780

The following statement refers to a VAX-11/780 with a TC11 at the standard address and vector (772520, 224) and UNIBUS adapter UBA0:, which corresponds to TR 3:

```
EVM>SET CONFIG/CSR:772520/VECTOR:224/TR:3/BR:5/UBR:5<return>
```

/TR is optional in this statement, because it needs to be specified only if it is different from the default value (TR 3, UBA0:). Standard values for TR are 3 through 6 for UNIBUS adapters:

```
TR 3      UBA0, 20100000
TR 4      UBA1, 20140000
TR 5      UBA2, 20180000
TR 6      UBA3, 201C0000
```

Similarly, /BR and /UBR need to be specified only if the UNIBUS adapter has BR and UBR levels other than 5. Valid values for BR are 4 through 7, with 5 the default.

### 2.2.5 START PROCEDURE

After typing the LOAD statement and the appropriate SET CONFIGURATION statement, type:

```
EVM>START/TEST:n/PASSES:x<return>
```



## Load and Start Procedures

where *n* represents the decimal test number (or range of test numbers) that the operator wishes to run, and *x* is the number of passes in the range 0 through 100. See the EVM User's Guide for more information regarding command syntax.

/TEST is an optional qualifier. If it is omitted, EVM runs all the tests. If the /TEST qualifier is included, at least one test must be specified. To designate a range of test numbers, include the numbers of the first and last tests in the range, separated by a colon. Examples of syntax appear in subsections 2.3 and 2.4 of this document.

The /PASSES qualifier is also optional and needs to be specified only if multiple passes are desired. Acceptable values for *x* are 0 through 100, where 0 signifies an infinite number of passes and 1 is the default.

### 2.3 TESTS

This subsection contains descriptions of the 27 diagnostic tests available with IUT11. These tests are divided into four sections: Functionality, Configuration, PE, and Tape.

#### NOTE

The HELP facility documented in the EVM user's guide is not yet available with the IUT11 diagnostic.

#### 2.3.1 FUNCTIONALITY SECTION: TESTS 1 THROUGH 12

This section checks the basic TC11 functionality, such as register read/write, correct error detection, controller initialization, and bus address checks. The following statement will run tests 1 through 12:

```
EVM>START/TEST:1:12<return>
```

For explanations of register names and other technical terms used in this subsection, see the TC11 technical manual, referenced in subsection 1.5.

### Test 1 Address All Registers

This test verifies that all registers can be addressed. It issues a power clear, reads all registers, and checks for correct initialized values.

### Test 2 MTBRC Register (All Ones and Zeros)

This test verifies that the byte/record count register (MTBRC) can be loaded. It issues a power clear, loads MTBRC with ones, and then reads and checks the register contents. After another power clear it loads MTBRC with zeros, then reads and checks the contents.

### Test 3 MTBRC Register (Moving Ones and Zeros)

This test verifies that each bit in the MTBRC register can be set and cleared.

### Test 4 MTCMA Register (All Ones and Zeros)

This test checks to determine that the current memory address register can be loaded. After power clear, it loads the current memory address with ones and then reads and checks MTCMA. After another power clear, the same steps are repeated except that the current address is loaded with zeros.

### Test 5 MTCMA Register (Moving Ones and Zeros)

This test checks the memory address register with a single 1 bit and with a single 0 bit. After a power clear, it loads the current address with moving ones and reads and checks the contents. The same steps are repeated, but with moving zeros.

### Test 6 MTD Register (All Ones and Zeros)

This test verifies that the data buffer register can be loaded. After power clear, it loads the data buffer with ones and then reads and checks MTD. After another power clear, it loads the data buffer with zeros and then reads and checks MTD.

## Load and Start Procedures

### Test 7 MTD Register (Moving Ones and Zeros)

This test checks the data buffer with a single 1 bit and with a single 0 bit. After a power clear, it loads the current address with moving ones and reads and checks the contents. The same steps are repeated, but with moving zeros.

### Test 8 Check Unit Select Bits

This test verifies that each unit select bit can be set and cleared. After a power clear, it sets a unit number, reads it back, and checks for the correct value. These steps are repeated for all values.

### Test 9 Check IE Bit

This test checks to determine that the IE bit allows interrupts. After a power clear, it sets the IE bit and then checks for an interrupt.

### Test 10 Check Extended Addressing Bits

This test verifies that the extended addressing bits can be set and cleared. After a power clear, it sets the addressing bit, reads it back, and checks for the correct value. These steps are repeated for all values.

### Test 11 Check Byte Loading of MTC

This test verifies that the function bits can be byte loaded. After a power clear, it loads a function (less the GO bit), reads the function back, clears the RDY bit, and checks for the expected value. These steps are repeated for all functions.

### Test 12 Check Density Select Bits

This test checks to determine that each density select bit can be set and cleared. After power clear, it sets a density select bit, reads it back, and checks for the correct value. These steps are repeated for all values.

## 2.3.2 CONFIGURATION SECTION

This section consists of a single test, test 13, which displays the TC11 tape controller configuration. The following statement will run test 13 only:

```
EVM>START/TEST:13<return>
```

### Test 13 Display Controller Configuration

This test determines and displays the TC11 tape controller configuration. It checks for PE, TUR, WRL, and BOT. The test steps are repeated for four unit numbers.

#### 2.3.3 PE SECTION

This section consists of a single test, test 14, which is used to execute the built-in diagnostics of the PE board. This self-test consists of a simulated phase-encoded record, which contains a preamble, 20 identical data characters, and a shortened postamble.

This test section cannot be run if the PE option is not installed. The following statement will run test 14 only:

```
EVM>START/TEST:14<return>
```

### Test 14 Execute Internal PE Board Test

After a power clear, this test executes the internal PE board test. It determines that there is no PE board, and checks for PE test errors, if the character counter does not change after 5 seconds. (See subsection 2.4 of this document for an example.)

#### 2.3.4 TAPE SECTION

This section, which includes tests 15 through 27, is used to execute tape motion in order to check tape transport operation. The tests check for BOT, Write and Read functions, Rewind, Space Forward, Space Reverse, EOT, and Offline function. Note that this section tests tape transport motion **only** and is not intended to check data reliability.

To use this section, you must mount a scratch tape (recommended length, 600 ft) and put the drive online.

All tests in the Tape section should be run in sequence, because some of them assume that previous tests have been performed. The result of running these tests out of sequence is unspecified. The Tape section is requested as follows:

```
EVM>START/TEST:15:27<return>
```

### Test 15 Check for BOT

This test checks to determine that the TC11 tape controller "knows" when the drive is at BOT. After a power clear, it selects the drive and then checks for TUR, SELR, and BOT set.

## Load and Start Procedures

### Test 16 Check Rewind Function

The test issues a power clear and verifies that the drive is at BOT. Then it issues a three-byte write and checks the status of the affected bits and registers. It then issues a Rewind command and checks the status of the affected bits.

### Test 17 Check Write Function

This test checks for byte count and address increment, by writing a one-byte record and a 512-byte record and checking the status of the affected bits and registers.

### Test 18 Check Read Function

This test checks to determine that the Read function is operating correctly, by reading a one-byte record and a 512-byte record and checking the status of the affected bits and registers.

### Test 19 Check Write EOF Function

This test checks the to determine that the Write EOF function is operating correctly, by writing EOF and checking the status of the affected bits and registers.

### Test 20 Check Space Forward/Reverse Commands

This checks the Space Forward and Space Reverse commands, by issuing these commands and checking the status of the affected bits and registers.

### Test 21 Check Rewind and Backspace Ignored at BOT

This test verifies that the Rewind and Space Reverse commands are ignored when the tape is positioned at BOT. It issues these commands and checks the status of the affected bits and registers.

### Test 22 Check That NXM Bit Can Set

This test verifies that the NXM (non-existent memory) bit can be set, by forcing a read with invalid current memory address and checking the status of the affected bits and registers.

Test 23 Check That Rewind Causes Two Interrupts

This test checks to determine that the Rewind function causes two interrupts. It issues a Rewind function and waits for two interrupts to occur.

Test 24 Data Transfer Test

This test checks data transfer with a known data pattern.

Test 25 Tape Positioning Test

This test checks to determine that the tape position does not get lost, by issuing repeated Space Forward and Space Reverse commands and verifying that tape position is correct.

Test 26 Check for EOT

This test verifies that the EOT bit sets and stops operation. After power clear, it issues a Rewind command, enables interrupts, and issues a 512-byte Read. It then waits for the interrupt and checks if EOT is set. The test continues until EOT sets or a timeout occurs. Interrupts are then disabled.

Test 27 Check Offline Function

This test checks the Offline function by checking for TUR and SELR set, issuing an Offline function, and verifying that TUR and SELR are clear.

## 2.4 SAMPLE DIALOG

In this example, the operator has requested that all tests be run:

```
EVM>START<return>
```

The program announces itself, and then runs all of the tests. As each test is executed, its title appears on the screen. (In some instances, program output has been continued to a second line of text here because of space limitations.)

Note that test 13 displays the controller configuration.

## Sample Dialog

Emulex TC11 Tape Controller Diagnostic REV Vx.x dd-mmm-yyyy  
Time

Begin testing drive 0 as 800 BPI (NRZI), 9 track

-----> BEGINNING OF PASS 1

TEST # 1 Address all registers dd-mmm-yyyy Time  
TEST # 2 MTBRC register (all 1 & 0) dd-mmm-yyyy Time  
TEST # 3 MTBRC register (moving 1 & 0) dd-mmm-yyyy Time  
TEST # 4 MTCMA register (all 1 & 0) dd-mmm-yyyy Time  
TEST # 5 MTCMA register (moving 1 & 0) dd-mmm-yyyy Time  
TEST # 6 MTD register (all 1 & 0) dd-mmm-yyyy Time  
TEST # 7 MTD register (moving 1 & 0) dd-mmm-yyyy Time  
TEST # 8 Check UNIT SELECT bits dd-mmm-yyyy Time  
TEST # 9 Check IE bit dd-mmm-yyyy Time  
TEST # 10 Check EXTENDED ADDRESSING bits dd-mmm-yyyy Time  
TEST # 11 Check byte loading of MTC dd-mmm-yyyy Time  
TEST # 12 Check DENSITY SELECT bits dd-mmm-yyyy Time  
TEST # 13 Display controller configuration dd-mmm-yyyy Time

Emulex TC11 Tape Controller CSR [172520]

800(NRZI) BPI.

Drive 0 responded ready , NOT Write Locked , at BOT

Drive 1 responded NOT ready

Drive 2 responded NOT ready

Drive 3 responded NOT ready

TEST # 14 Execute internal PE test dd-mmm-yyyy Time  
PE mode not selected, test skipped  
TEST # 15 Check for BOT dd-mmm-yyyy Time  
TEST # 16 Check Rewind function dd-mmm-yyyy Time  
TEST # 17 Check Write function dd-mmm-yyyy Time  
TEST # 18 Check Read function dd-mmm-yyyy Time  
TEST # 19 Check Write EOF function dd-mmm-yyyy Time  
TEST # 20 Check Space Forward/Reverse functions dd-mmm-yyyy  
Time  
TEST # 21 Check Rewind & Backspace ignored at BOT dd-mmm-yyyy  
Time  
TEST # 22 Check that NXM bit can set dd-mmm-yyyy Time  
TEST # 23 Check Rewind causes two interrupts dd-mmm-yyyy Time  
TEST # 24 Data transfer test dd-mmm-yyyy Time  
TEST # 25 Tape positioning test dd-mmm-yyyy Time  
TEST # 26 Check for EOT dd-mmm-yyyy Time  
EOT reached, rewinding tape  
TEST # 27 Check OFF-LINE function dd-mmm-yyyy Time  
-----> END OF PASS 1

### SUMMARY REPORT:

TOTAL # ERRORS = 0 (0 SYSTEM, 0 DEVICE, 0 HARD, 0 SOFT)  
dd-mmm-yyyy Time

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